THE ASTROPHYSICAL JOURNAL

CONTENTS OF VOLUME 590, PART 1

2003 JUNE 10, NUMBER 1

	Page
INFERRING THE LINEAR POWER SPECTRUM FROM THE Lyα FOREST *Matias Zaldarriaga, Román Scoccimarro, & Lam Hui*	1
AUTOCORRELATION FUNCTION OF THE SOFT X-RAY BACKGROUND PRODUCED BY WARM-HOT GAS IN DARK HALOS *Xiang-Ping Wu & Yan-Jie Xue*	8
COSMOLOGICAL CONSTRAINTS FROM THE EVOLUTION OF THE CLUSTER BARYON MASS FUNCTION AT $z \sim 0.5$ *A. Vikhlinin, A. Voevodkin, C. R. Mullis, L. VanSpeybroeck, H. Quintana, B. R. McNamara, I. Gioia, A. Hornstrup, J. P. Henry, W. R. Forman, & C. Jones*	15
THE QUINTUPLE QUASAR: RADIO AND OPTICAL OBSERVATIONS *Joshua N. Winn, Christopher S. Kochanek, Charles R. Keeton, & James E. J. Lovell*	26
THE QUINTUPLE QUASAR: MASS MODELS AND INTERPRETATION Ⓔ *Charles R. Keeton & Joshua N. Winn*	39
AN ACCRETION MODEL FOR THE GROWTH OF THE CENTRAL BLACK HOLE ASSOCIATED WITH IONIZATION INSTABILITY IN QUASARS *Y. Lu, K. S. Cheng, & S. N. Zhang*	52
TECHNIQUE FOR DETECTING WARM-HOT INTERGALACTIC GAS IN QUASAR ULTRAVIOLET SPECTRA *Luc Binette, Mario Rodríguez-Martínez, Sinhue Haro-Corzo, & Isidro Ballinas*	58
THE NATURE OF THE ULTRAVIOLET/X-RAY ABSORBER IN PG 2302+029 *Bassem M. Sabra, Fred Hamann, Buell T. Jannuzi, Ian M. George, & Joseph C. Shields*	66
AN ACTIVE GALACTIC NUCLEUS SAMPLE WITH HIGH X-RAY–TO–OPTICAL FLUX RATIO FROM RASS. II. OPTICAL EMISSION LINE PROPERTIES OF SEYFERT 1–TYPE ACTIVE GALACTIC NUCLEI *D. W. Xu, Stefanie Komossa, J. Y. Wei, Y. Qian, & X. Z. Zheng*	73
ON THE NATURE OF LOW-LUMINOSITY NARROW-LINE ACTIVE GALACTIC NUCLEI *Ari Laor*	86
TESTING OF INVERSE COMPTON MODELS FOR ACTIVE GALACTIC NUCLEI WITH GAMMA-RAY AND RADIO OBSERVATIONS *A. Lähteenmäki & E. Valtaoja*	95
THE GAMMA-RAY BLAZAR CONTENT OF THE NORTHERN SKY Ⓔ *David Sowards-Emmerd, Roger W. Romani, & Peter F. Michelson*	109
SPECTRAL SLOPE VARIABILITY OF BL LACERTAE OBJECTS IN THE OPTICAL BAND *Fausto Vagnetti, Dario Trevese, & Roberto Nesci*	123
THE FAR-INFRARED SPECTRAL ENERGY DISTRIBUTIONS OF X-RAY–SELECTED ACTIVE GALAXIES *Joanna K. Kuraszkiewicz, Belinda J. Wilkes, Eric, J. Hooper, Kim K. McLeod, Kenneth Wood, Jon Bjorkman, Kisha M. Delain, David H. Hughes, Martin S. Elvis, Chris D. Impey, Carol J. Lonsdale, Matt A. Malkan, Jonathan C. McDowell, & Barbara Whitney*	128
THE FLARING H_2O MEGAMASER AND COMPACT RADIO SOURCE IN MARKARIAN 348 *A. B. Peck, C. Henkel, J. S. Ulvestad, A. Brunthaler, H. Falcke, M. Elitzur, K. M. Menten, & J. F. Gallimore*	149
A WARPED ACCRETION DISK AND WIDE-ANGLE OUTFLOW IN THE INNER PARSEC OF THE CIRCINUS GALAXY *L. J. Greenhill, R. S. Booth, S. P. Ellingsen, J. R. Herrnstein, D. L. Jauncey, P. M. McCulloch, J. M. Moran, R. P. Norris, J. E. Reynolds, & A. K. Tzioumis*	162
CONTRASTING THE ULTRAVIOLET AND X-RAY O VI COLUMN DENSITY INFERRED FOR THE OUTFLOW IN NGC 5548 *Nahum Arav, Jelle Kaastra, Katrien Steenbrugge, Bert Brinkman, Rick Edelson, Kirk T. Korista, & Martijn de Kool*	174
RENEWED ACTIVITY IN THE RADIO GALAXY PKS B1545−321: TWIN EDGE-BRIGHTENED BEAMS WITHIN DIFFUSE RADIO LOBES *Lakshmi Saripalli, Ravi Subrahmanyan, & N. Udaya Shankar*	181

Page

VARIABILITY OF SUBMILLIJANSKY RADIO SOURCES 192
C. L. Carilli, R. J. Ivison, & D. A. Frail

MASS-TEMPERATURE RELATION OF GALAXY CLUSTERS: IMPLICATIONS FROM THE OBSERVED LUMINOSITY-TEMPERATURE RELATION AND X-RAY TEMPERATURE FUNCTION Ⓔ 197
Mamoru Shimizu, Tetsu Kitayama, Shin Sasaki, & Yasushi Suto

HIGH-RESOLUTION X-RAY SPECTROSCOPIC CONSTRAINTS ON COOLING-FLOW MODELS FOR CLUSTERS OF GALAXIES 207
J. R. Peterson, S. M. Kahn, F. B. S. Paerels, J. S. Kaastra, T. Tamura, J. A. M. Bleeker, C. Ferrigno, & J. G. Jernigan

XMM-NEWTON OBSERVATIONS OF THE PERSEUS CLUSTER. I. THE TEMPERATURE AND SURFACE BRIGHTNESS STRUCTURE 225
E. Churazov, W. Forman, C. Jones, & H. Böhringer

Cl 1358+62: CHARACTERIZING THE PHYSICAL PROPERTIES OF CLUSTER GALAXIES AT $z = 0.33$ Ⓔ 238
Kim-Vy H. Tran, Luc Simard, Garth Illingworth, & Marijn Franx

THE CEPHEID DISTANCE TO NGC 5236 (M83) WITH THE ESO VERY LARGE TELESCOPE Ⓔ 256
Frank Thim, G. A. Tammann, A. Saha, A. Dolphin, Allan Sandage, E. Tolstoy, & Lukas Labhardt

A TURBULENT ORIGIN FOR FLOCCULENT SPIRAL STRUCTURE IN GALAXIES 271
Bruce G. Elmegreen, Debra Meloy Elmegreen, & Samuel N. Leitner

THE OPTICAL GRAVITATIONAL LENSING EXPERIMENT: IS INTERSTELLAR EXTINCTION TOWARD THE GALACTIC CENTER ANOMALOUS? 284
A. Udalski

SUPPRESSION OF FAST RECONNECTION BY MAGNETIC SHEAR 291
Fabian Heitsch & Ellen G. Zweibel

[Fe IV] EMISSION IN IONIZED NEBULAE 296
Mónica Rodríguez

DIFFUSE X-RAY EMISSION FROM THE QUIESCENT SUPERBUBBLE M17, THE OMEGA NEBULA 306
Bryan C. Dunne, You-Hua Chu, C.-H. Rosie Chen, Justin D. Lowry, Leisa Townsley, Robert A. Gruendl, Martín A. Guerrero, & Margarita Rosado

A SURVEY OF ACETIC ACID TOWARD HOT MOLECULAR CORES 314
A. Remijan, L. E. Snyder, D. N. Friedel, S.-Y. Liu, & R. Y. Shah

IMAGES OF ASTROPHYSICAL MASERS AND THEIR VARIABILITY IN A TURBULENT MEDIUM: THE 25 GHz METHANOL MASERS 333
A. M. Sobolev, W. D. Watson, & V. A. Okorokov

ADAPTIVE OPTICS SPECTROSCOPY OF THE [Fe II] OUTFLOW FROM DG TAURI 340
Tae-Soo Pyo, Naoto Kobayashi, Masahiko Hayashi, Hiroshi Terada, Miwa Goto, Hideki Takami, Naruhisa Takato, Wolfgang Gaessler, Tomonori Usuda, Takuya Yamashita, Alan T. Tokunaga, Yutaka Hayano, Yukiko Kamata, Masanori Iye, & Yosuke Minowa

NEW LOW-MASS MEMBERS OF THE TAURUS STAR-FORMING REGION 348
K. L. Luhman, César Briceño, John R. Stauffer, Lee Hartmann, D. Barrado y Navascués, & Nelson Caldwell

INTRINSIC PROPERTIES OF THE YOUNG STELLAR OBJECT SU AURIGAE 357
L. E. DeWarf, J. F. Sepinsky, E. F. Guinan, I. Ribas, & I. Nadalin

MODELING THE INFRARED EMISSION FROM THE HR 4796A DISK 368
Aigen Li & J. I. Lunine

A STANDARD KINETIC ENERGY RESERVOIR IN GAMMA-RAY BURST AFTERGLOWS 379
E. Berger, S. R. Kulkarni, & D. A. Frail

RADIATION OF NEUTRON STARS PRODUCED BY SUPERFLUID CORE 386
Anatoly A. Svidzinsky

TOWARD AN EMPIRICAL THEORY OF PULSAR EMISSION. VIII. SUBBEAM CIRCULATION AND THE POLARIZATION-MODAL STRUCTURE OF CONAL BEAMS 411
Joanna M. Rankin & R. Ramachandran

X-RAY PULSES FROM ACCRETION COLUMNS: CONTRIBUTIONS TO THE ENERGY DEPENDENCE OF THE PULSE SHAPE 424
U. Kraus, C. Zahn, C. Weth, & H. Ruder

DISCRETE X-RAY SIGNATURES OF A PHOTOIONIZED PLASMA ABOVE THE ACCRETION DISK OF THE NEUTRON STAR EXO 0748−676 432
M. A. Jimenez-Garate, N. S. Schulz, & H. L. Marshall

RX J0513.9−6951: THE FIRST EXAMPLE OF ACCRETION WIND EVOLUTION, A KEY EVOLUTIONARY PROCESS TO TYPE Ia SUPERNOVAE 445
Izumi Hachisu & Mariko Kato

CONTENTS

	Page
THE THREE-DIMENSIONAL KINEMATICS OF WATER MASERS AROUND THE SEMIREGULAR VARIABLE RT VIRGINIS *Hiroshi Imai, Katsunori M. Shibata, Kevin B. Marvel, Philip J. Diamond, Tetsuo Sasao, Makoto Miyoshi, Makoto Inoue, Victor Migenes, & Yasuhiro Murata*	460
THE STATISTICAL SOBOLEV-ROSSELAND MEAN AND THE EFFECTS OF FREQUENCY REDISTRIBUTION ON WOLF-RAYET WIND DRIVING *A. J. Onifer & K. G. Gayley*	473
DISCOVERY OF HIGHLY DYNAMIC MATTER ENHANCEMENTS ALONG THE POLAR AXIS AND EQUATORIAL PLANE IN THE LUMINOUS BLUE VARIABLE BINARY HD 5980 *A. Villar-Sbaffi, Anthony F. J. Moffat, & N. St-Louis,*	483
ASTEROSPHERIC MAGNETIC FIELDS AND WINDS OF COOL STARS *Carolus J. Schrijver, Marc L. DeRosa, & Alan M. Title*	493
CORRELATIONS ON ARCSECOND SCALES BETWEEN CHROMOSPHERIC AND TRANSITION REGION EMISSION IN ACTIVE REGIONS *B. De Pontieu, T. Tarbell, & R. Erdélyi*	502
SOHO-ULYSSES SPRING 2000 QUADRATURE: CORONAL DIAGNOSTIC SPECTROMETER AND SUMER RESULTS *S. Parenti, E. Landi, & B. J. I. Bromage*	519
CONSTRAINTS ON CORONAL MASS EJECTION DYNAMICS FROM SIMULTANEOUS RADIO AND WHITE-LIGHT OBSERVATIONS *M. J. Reiner, A. Vourlidas, O. C. St. Cyr, J. T. Burkepile, R. A. Howard, M. L. Kaiser, N. P. Prestage, & J.-L. Bougeret*	533
CONSTRAINTS ON ACTIVE REGION CORONAL HEATING Ⓔ *S. K. Antiochos, J. T. Karpen, E. E. DeLuca, L. Golub, & P. Hamilton*	547
EVOLUTION OF MAGNETIC FIELDS IN COROTATING INTERACTION REGIONS FROM 1 TO 95 AU: ORDER TO CHAOS Ⓔ *L. F. Burlaga, C. Wang, J. D. Richardson, & N. F. Ness*	554
DOES THE SUN SHRINK WITH INCREASING MAGNETIC ACTIVITY? *H. M. Antia*	567
SATURATED HYDROCARBONS IN COMET 153P/IKEYA-ZHANG: ETHANE, METHANE, AND MONODEUTERIO-METHANE *Hideyo Kawakita, Jun-ichi Watanabe, Daisuke Kinoshita, Masateru Ishiguro, & Ryosuke Nakamura*	573
ZINC CRYSTAL GROWTH IN MICROGRAVITY *B. P. Michael, Joseph A. Nuth III, & Lembit U. Lilleleht*	579
REFINING *CHANDRA*/ACIS SUBPIXEL EVENT REPOSITIONING USING A BACKSIDE-ILLUMINATED CCD MODEL Ⓔ *Jingqiang Li, Joel H. Kastner, Gregory Y. Prigozhin, & Norbert S. Schulz*	586
SPIDERWEB MASKS FOR HIGH-CONTRAST IMAGING *Robert J. Vanderbei, David N. Spergel, & N. Jeremy Kasdin*	593
EMISSION-LINE SPECTRA OF Ar IX–Ar XVI IN THE SOFT X-RAY REGION 20–50 Å *J. K. Lepson, P. Beiersdorfer, E. Behar, & S. M. Kahn*	604

2003 JUNE 20, NUMBER 2

SIMULATIONS OF GALAXY FORMATION IN A ΛCDM UNIVERSE. III. THE DISSIPATIVE FORMATION OF AN ELLIPTICAL GALAXY Ⓔ *Andrés Meza, Julio F. Navarro, Matthias Steinmetz, & Vincent R. Eke*	619
CLUSTER FORMATION RATE IN MODELS WITH DARK ENERGY *Spyros Basilakos*	636
GALAXY FORMATION IN TRIAXIAL HALOS: BLACK HOLE–BULGE–DARK HALO CORRELATION *Amr A. El-Zant, Isaac Shlosman, Mitchell C. Begelman, & Juhan Frank*	641
SPATIAL AND DYNAMICAL BIASES IN VELOCITY STATISTICS OF GALAXIES *Kohji Yoshikawa, Y. P. Jing, & Gerhard Börner*	654
THE FAR-INFRARED BACKGROUND CORRELATION WITH COSMIC MICROWAVE BACKGROUND LENSING Ⓔ *Yong-Seon Song, Asantha Cooray, Lloyd Knox, & Matias Zaldarriaga*	664
SEMILINEAR GRAVITATIONAL LENS INVERSION *S. J. Warren & S. Dye*	673

CONTENTS

	Page
PROPAGATION SPEED OF GRAVITY AND THE RELATIVISTIC TIME DELAY *Clifford M. Will*	683
LOW-FREQUENCY GRAVITATIONAL WAVES FROM MASSIVE BLACK HOLE BINARIES: PREDICTIONS FOR *LISA* AND PULSAR TIMING ARRAYS *J. Stuart B. Wyithe & Abraham Loeb*	691
A *HUBBLE SPACE TELESCOPE* WFPC2 SNAPSHOT SURVEY OF 2MASS-SELECTED RED QSOs *Andrew R. Marble, Dean C. Hines, Gary D. Schmidt, Paul S. Smith, Jason A. Surace, Lee Armus, Roc M. Cutri, & Brant O. Nelson*	707
CHANDRA ACIS-S OBSERVATIONS OF THREE QUASARS WITH LOW-REDSHIFT DAMPED Lyα ABSORPTION: CONSTRAINTS ON THE COSMIC NEUTRAL GAS-PHASE METALLICITY AT REDSHIFT $z \approx 0.4$ *David A. Turnshek, Sandhya M. Rao, Andrew F. Ptak, Richard E. Griffiths, & Eric M. Monier*	730
THE MOLECULAR DISK IN THE CLOVERLEAF QUASAR *S. Venturini & P. M. Solomon*	740
THE MULTIPHASE ABSORPTION SYSTEMS TOWARD PG 1206+459 Ⓔ *Jie Ding, Jane C. Charlton, Christopher W. Churchill, & Christopher Palma*	746
ERO R1 IN THE FIELD OF CL 0939+4713: EVIDENCE FOR AN S0-LIKE GALAXY AT $z \sim 1.5$ *Masanori Iye, Kazuhiro Shimasaku, Satoshi Miyazaki, Chris Simpson, Masatoshi Imanishi, Nobunari Kashikawa, Tadayuki Kodama, Masashi Chiba, Yoshihiko Saito, Miwa Goto, Fumihide Iwamuro, Naoto Kobayashi, Sadanori Okamura, & Hiroshi Terada*	770
SUPERNOVA ENRICHMENT OF DWARF SPHEROIDAL GALAXIES *P. Chris Fragile, Stephen D. Murray, Peter Anninos, & Douglas N. C. Lin*	778
ON THE RAPIDLY COOLING INTERIOR OF SUPERGALACTIC WINDS *S. Silich, G. Tenorio-Tagle, & C. Muñoz-Tuñón*	791
SOME GLOBAL CHARACTERISTICS OF THE GALACTIC GLOBULAR CLUSTER SYSTEM Ⓔ *Sidney Van Den Bergh*	797
STAR FORMATION HISTORY OF ω CENTAURI IMPRINTED IN ELEMENTAL ABUNDANCE PATTERNS *Takuji Tsujimoto & Toshikazu Shigeyama*	803
A *CHANDRA* X-RAY STUDY OF THE DENSE GLOBULAR CLUSTER TERZAN 5 *C. O. Heinke, P. D. Edmonds, J. E. Grindlay, D. A. Lloyd, H. N. Cohn, & P. M. Lugger*	809
THE SUPERBUBBLE ORIGIN OF ^{22}Ne IN COSMIC RAYS *J. C. Higdon & R. E. Lingenfelter*	822
THE PHYSICS OF SUPERNOVA BLAST WAVES. I. KINEMATICS OF DEM L71 IN THE LARGE MAGELLANIC CLOUD *Parviz Ghavamian, Cara E. Rakowski, John P. Hughes, & T. B. Williams*	833
THE PHYSICS OF SUPERNOVA REMNANT BLAST WAVES. II. ELECTRON-ION EQUILIBRATION IN DEM L71 IN THE LARGE MAGELLANIC CLOUD *Cara E. Rakowski, Parviz Ghavamian, & John P. Hughes*	846
SPECTRAL PROPERTIES OF COMPRESSIBLE MAGNETOHYDRODYNAMIC TURBULENCE FROM NUMERICAL SIMULATIONS Ⓔ *Jason G. Vestuto, Eve C. Ostriker, & James M. Stone*	858
PHOTODESTRUCTION OF RELEVANT INTERSTELLAR MOLECULES IN ICE MIXTURES *Hervé Cottin, Marla H. Moore, & Yves Bénilan*	874
SUBMILLIMETER WAVE ASTRONOMY SATELLITE MAPPING OBSERVATIONS OF WATER VAPOR AROUND SAGITTARIUS B2 Ⓔ *David A. Neufeld, Edwin A. Bergin, Gary J. Melnick, & Paul F. Goldsmith*	882
TWO MOLECULAR CLOUDS NEAR M17 Ⓔ *T. L. Wilson, M. M. Hanson, & D. Muders*	895
THE IMPACT OF IONIZING STARS ON THE DIFFUSE INTERSTELLAR MEDIUM: A SWEPT-UP SHELL AND IONIZED HALO AROUND THE W4 CHIMNEY/SUPERBUBBLE *S. Terebey, M. Fich, R. Taylor, Y. Cao, & T. Hancock*	906
TRAPPED PROTOSTELLAR WINDS AND THEIR BREAKOUT *Francis P. Wilkin & Steven W. Stahler*	917
INTERACTION BETWEEN THE OUTFLOW AND THE CORE IN IRAM 04191+1522 *Shigehisa Takakuwa, Nagayoshi Ohashi, & Naomi Hirano*	932
MULTICOLOR LIGHT CURVES OF TYPE Ia SUPERNOVAE ON THE COLOR-MAGNITUDE DIAGRAM: A NOVEL STEP TOWARD MORE PRECISE DISTANCE AND EXTINCTION ESTIMATES Ⓔ *Lifan Wang, Gerson Goldhaber, Greg Aldering, & Saul Perlmutter*	944
MONTE CARLO STUDY OF SUPERNOVA NEUTRINO SPECTRA FORMATION *Mathias Th. Keil, Georg G. Raffelt, & Hans-Thomas Janka*	971

Page

THE BROADBAND AFTERGLOW OF GRB 980703 992
D. A. Frail, S. A. Yost, E. Berger, F. A. Harrison, R. Sari, S. R. Kulkarni, G. B. Taylor, J. S. Bloom, D. W. Fox, G. H. Moriarty-Schieven, & P. A. Price

EDDINGTON-LIMITED X-RAY BURSTS AS DISTANCE INDICATORS. I. SYSTEMATIC TRENDS AND SPHERICAL SYMMETRY IN BURSTS FROM 4U 1728−34 999
Duncan K. Galloway, Dimitrios Psaltis, Deepto Chakrabarty, & Michael P. Muno

THE NEARBY NEUTRON STAR RX J0720.4−3125 FROM RADIO TO X-RAYS 1008
D. L. Kaplan, M. H. van Kerkwijk, H. L. Marshall, B. A. Jacoby, S. R. Kulkarni, & D. A. Frail

RADIO POLARIZATION OF THE YOUNG HIGH-MAGNETIC-FIELD PULSAR PSR J1119−6127 1020
Fronefield Crawford & Nathan C. Keim

THE TRANSITION BETWEEN NONORTHOGONAL POLARIZATION MODES IN PSR B2016+28 AT 1404 MHz 1026
Mark M. McKinnon

THE COMPLETE Z DIAGRAM OF LMC X-2 1035
A. P. Smale, J. Homan, & E. Kuulkers

BOWEN FLUORESCENCE FROM THE COMPANION STAR IN X1822−371 Ⓔ 1041
J. Casares, D. Steeghs, R. I. Hynes, P. A. Charles, & K. O'Brien

AN ABUNDANCE ANALYSIS OF THE NEW CARBON-RICH PROTO-PLANETARY NEBULA IRAS 06530−0213 1049
Bruce J. Hrivnak & Bacham E. Reddy

THE THERMAL REGULATION OF GRAVITATIONAL INSTABILITIES IN PROTOPLANETARY DISKS 1060
Brian K. Pickett, Annie C. Mejia, Richard H. Durisen, Patrick M. Cassen, Donald K. Berry, & Robert P. Link

A SUB-SATURN MASS PLANET ORBITING HD 3651 Ⓔ 1081
Debra A. Fischer, R. Paul Butler, Geoffrey W. Marcy, Steven S. Vogt, & Gregory W. Henry

THE CONTRIBUTION OF FACULAE AND NETWORK TO LONG-TERM CHANGES IN THE TOTAL SOLAR IRRADIANCE 1088
Stephen R. Walton, Dora G. Preminger, & Gary A. Chapman

SPATIAL AND TEMPORAL PROPERTIES OF HOT AND COOL CORONAL LOOPS 1095
Shin'ichi Nagata, Hirohisa Hara, Ryouhei Kano, Ken Kobayashi, Taro Sakao, Toshifumi Shimizu, Saku Tsuneta, Tsuyoshi Yoshida, & Joseph B. Gurman

ON THE FLUCTUATING COMPONENT OF THE SUN'S LARGE-SCALE MAGNETIC FIELD 1111
Y.-M. Wang & N. R. Sheeley, Jr.

TEMPERATURE MEASUREMENTS IN THE SOLAR TRANSITION REGION USING N III LINE INTENSITY RATIOS 1121
R. Doron, G. A. Doschek, J. M. Laming, U. Feldman, & A. K. Bhatia

DIELECTRONIC RECOMBINATION RATE COEFFICIENTS FOR H-LIKE THROUGH Ne-LIKE ISOSEQUENCES OF Mg, Si, S, Ar, Ca, Fe, AND Ni Ⓔ 1131
M. F. Gu